The Transition of Atmospheric Infrared Sounder Total Ozone Products to Operations

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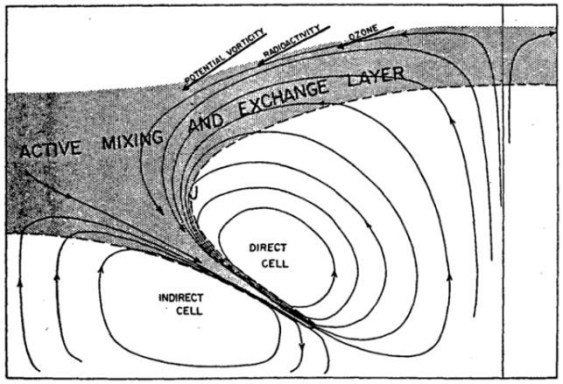
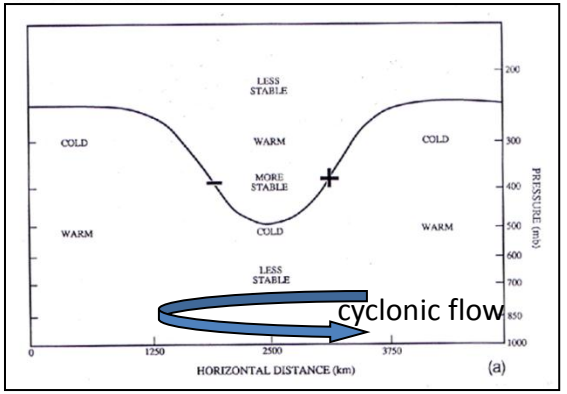
Why are AIRS Ozone Retrievals Important?

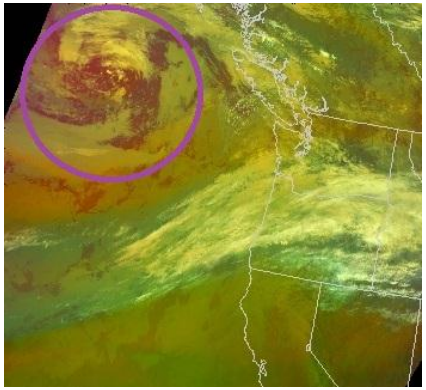
- High ozone values can indicate regions of stratospheric air and the potential for tropopause folding events
- Tropopause folds can be identified by potential vorticity and the presence of warm, dry, ozone-rich air
- Tropopause folds aid cyclogenesis or lead to non-convective wind events
- Complements the RGB Air mass product to identify stratospheric air and regions susceptible to tropopause folding



(Danielson 1968)



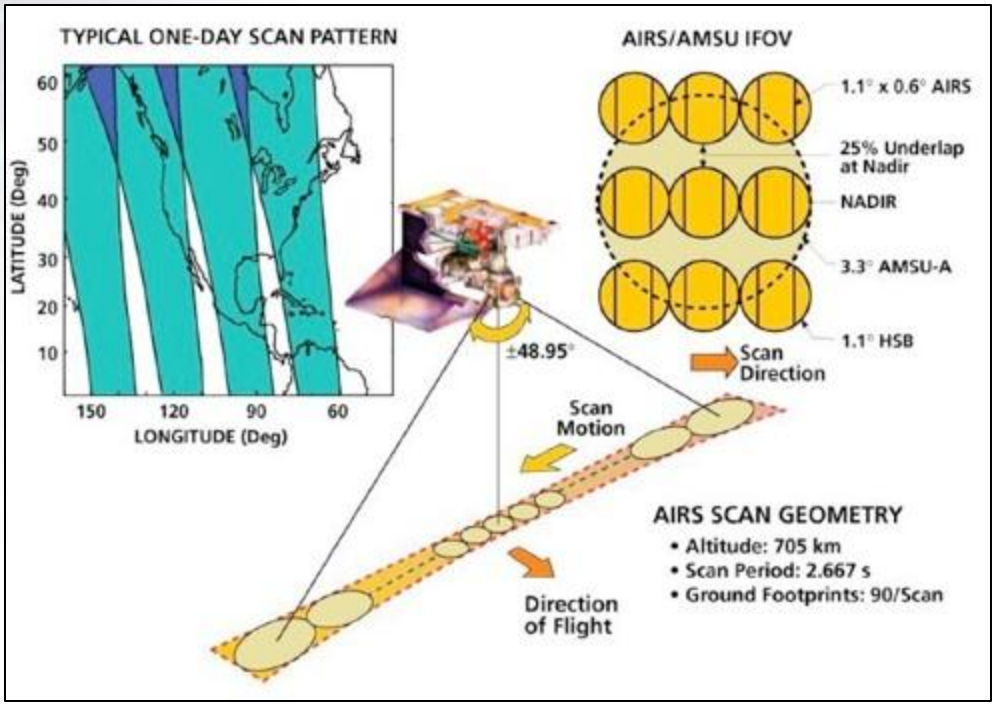
Bluestein (1993, Synoptic-Dynamic Met., vol. II)



MODIS RGB Air Mass Image
26 June 2013 1027 UTC

What is AIRS?

- Atmospheric Infrared Sounder (AIRS) is a hyperspectral IR sounder on the polar-orbiting Aqua spacecraft
- AIRS measures temperature and water vapor with height as well as clouds, ozone, carbon monoxide, carbon dioxide, methane, sulfur dioxide, and dust
- AIRS is limited in cloudy regions, therefore data are combined with data from microwave instruments (AMSU and HSB) on Aqua



http://airs.jpl.nasa.gov/instrument/how_AIRS_works/

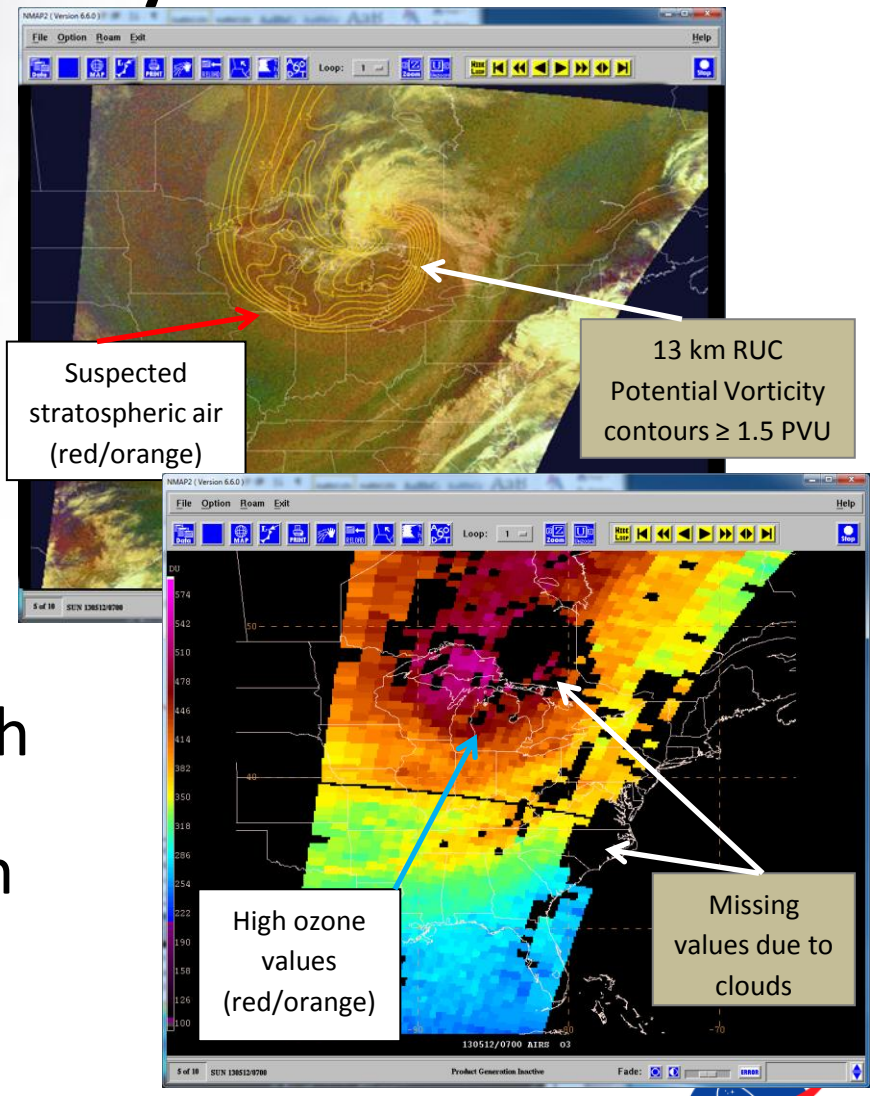
- 2378 channels from 3.75 – 15.4 µm
- Footprint of the L2 profiles is 45 km at nadir; 100 km at limbs
- Swath width of 1650 km

… and when is it available?

- 2x/day equatorial crossing time 1:30 AM and PM local time (slight daily orbital variation)
- Data obtained from NASA Land Atmosphere Near Real-time Capability for EOS (LANCE) at a 3-hr latency
- SPoRT produces 2 products in area and gridded format:
  - Total Column Ozone
  - Ozone Anomaly
- Due to processing the SPoRT AIRS products have a 4 hour latency

Example 12 May 2013

- SPoRT MODIS RGB Air Mass Image and 13-km RUC PV show a region of red/orange coloring surrounding the low pressure center
- AIRS Total Column Ozone confirms there are high zone values in the region
- How do we know if these high ozone values represent stratospheric air or are within the climatological range?

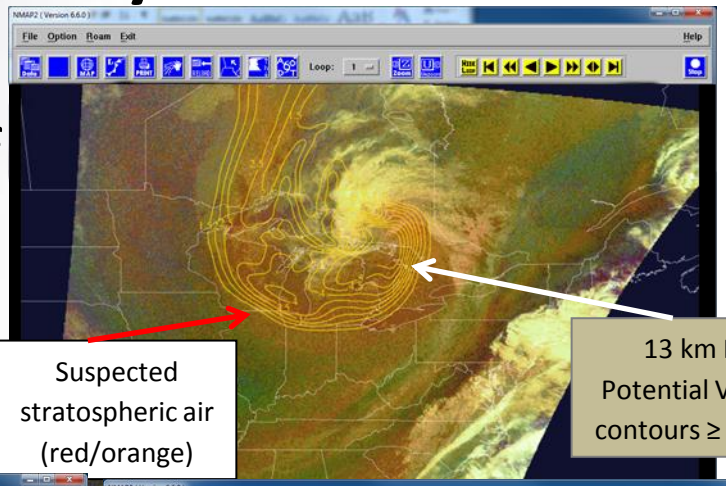


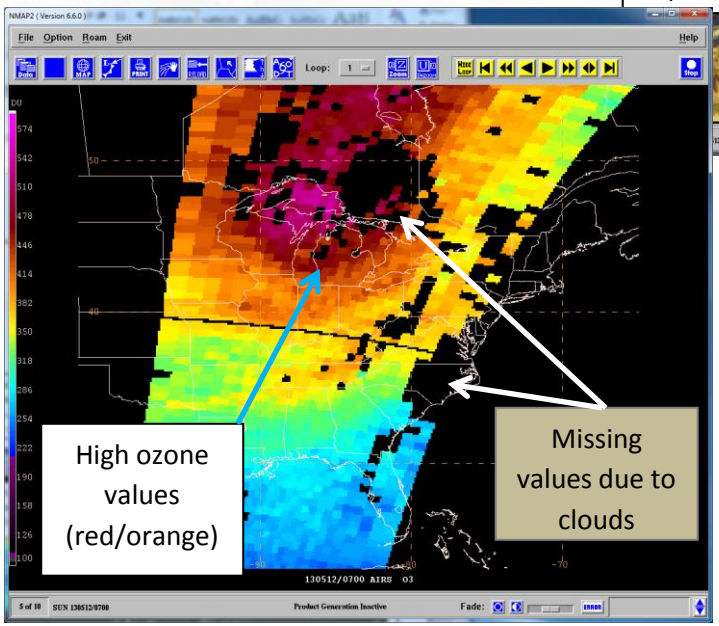
Ozone Anomaly Product

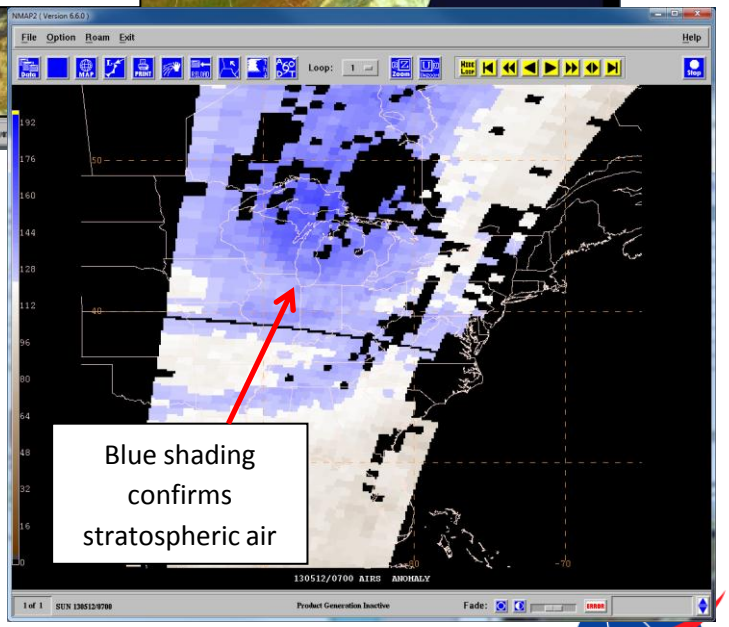
- Ozone's climatological mean varies seasonally and spatially
- Identification of stratospheric air based on high ozone values could lead to misinterpretation if the values actually range within climatology
- The AIRS Ozone Anomaly product clarifies the presence of stratospheric air based on:
  - Stratospheric air has ozone values at least 25% larger than the climatological mean (Van Haver et al. 1996)
  - Global and zonal monthly mean climatology of stratospheric ozone derived from the NASA Microwave Limb Sounder (Ziemke et al. 2011)

Example 12 May 2013

- SPoRT AIRS Ozone Anomaly product created as a percent of normal (0-200%)
- Shades of blue represent stratospheric air (ozone values $\geq 125\%$)







Transition to WPC/OPC/SAB

- Gridded product under evaluation 15 Jan – 1 May 2014
- Aid forecasting explosive cyclogenesis and hurricane force wind events in the Pacific and Atlantic Basins

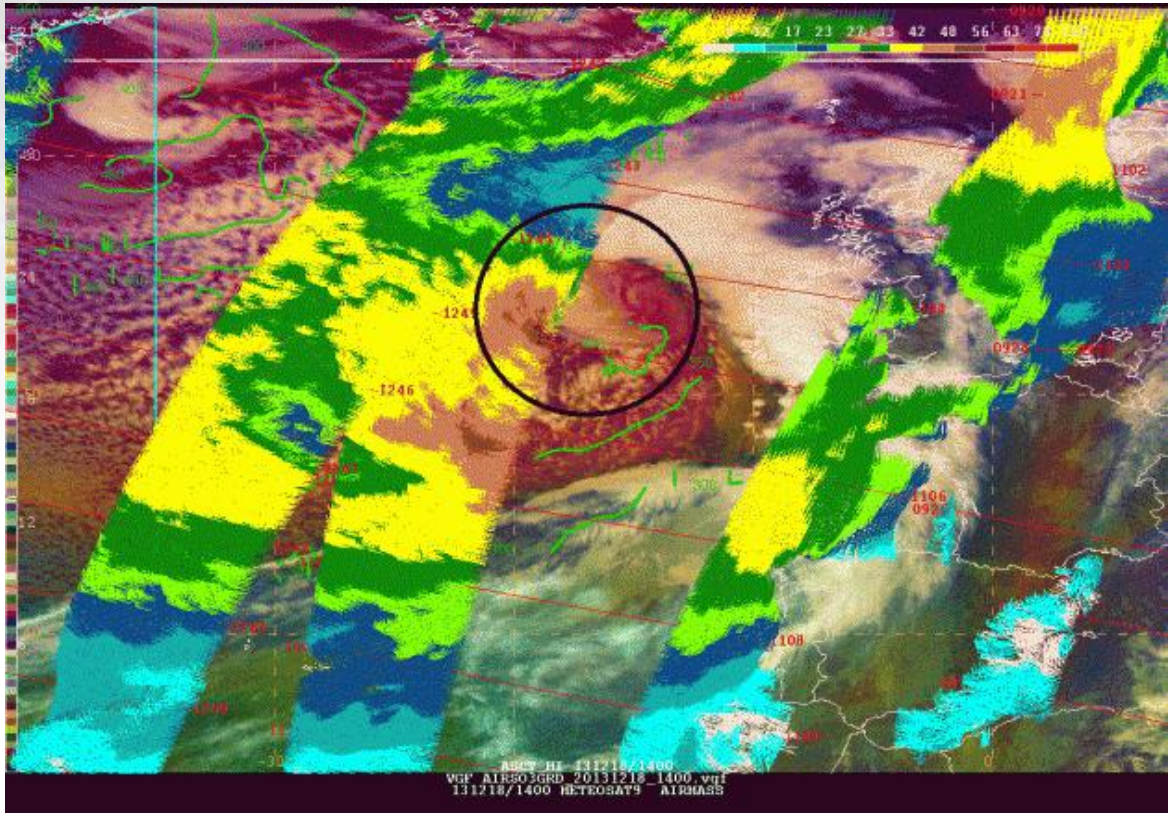


Image Courtesy of Michael Folmer
Satellite Liaison at NOAA/NWS
WPC/OPC/TAFB and NOAA/NESDIS SAB